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REPUBLIEK VAN SUID AFRIKA

PATENT KANTOOR
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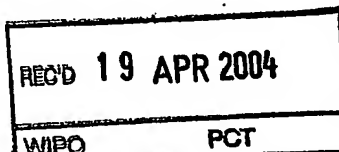


Certificate

REPUBLIC OF SOUTH AFRICA

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DEPARTMENT OF TRADE AND
INDUSTRY

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This is to certify that



the documents annexed hereto are true copies of:

Application forms P.1, P.2, provisional specification and drawing
of South African Patent Application No. 2002/9083 as originally filed
in the Republic of South Africa on 08 November 2002 in the name of
GRINAKER-LTA LIMITED for an invention entitled:
"MINE SUPPORT".

Geteken te
Signed at
PRETORIA

in die Republiek van Suid-Afrika, hierdie
in the Republic of South Africa, this

dag van
19th March 2004
day of

Registrar of Patents

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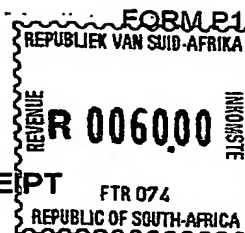
PATENTS ACT, 1978

REGISTRAR OF PATENTS

Official Application No.		Lodging date: Provisional		Acceptance date:	
21	01	22	8 November 2002	47	
International classification		Lodging date: Complete		Granted date:	
51		23			
Full name(s) of applicant(s)/Patentee(s)					
71	GRINAKE-LTA LIMITED				
Applicant(s) substituted:				Date Registered:	
71					
Assignee(s):				Date Registered:	
71					
Full name(s) of inventor(s)					
72	ERASMUS, Nico and VISAGIE, Joseph Cornelius				
Priority claimed		Country		Number	
Note:		33	NONE	31	NONE
Use International		33		31	
Abbreviation for Country		33		31	
Title of Invention:					
54	MINE SUPPORT				
Address of applicant(s)/patentee(s)					
30 van der Bijl Street, Westonaria, 1779					
Address for Service:					
74	McCALLUM, RADEMEYER & FREIMOND, Maclyn House, 7 June Avenue, Bordeaux, Randburg • P.O. Box 1130, Randburg 2125				
Patent of Addition to Patent No.:		Date of any change:			
61					
Fresh Application based on:		Date of any change:			

REPUBLIC OF SOUTH AFRICA
PATENTS ACT, 1978

APPLICATION FOR A PATENT AND ACKNOWLEDGEMENT OF RECEIPT
(Section 30(1) - Regulation 22)



The grant of a patent is hereby requested by the undermentioned applicant on the basis of the present application filed in duplicate

Revenue Stamps or Revenue Franking
Machine Impression

OFFICIAL APPLICATION NO.

21 01 **2002/9083**

OFFICIAL DATE STAMP

FULL NAME(S) OF APPLICANT(S)

71 GRINAKER-LTA LIMITED

ADDRESS(ES) OF APPLICANT(S)

30 van der Bijl Street, Westonaria, 1779

TITLE OF INVENTION

54 MINE SUPPORT

Priority is claimed as set out on the accompanying Form P2.

The earliest priority claimed is: NONE

This application is a patent of addition to Patent Application No.

21 01

This application is a fresh application in terms of section 37 and based on Application No.

21 01

THIS APPLICATION IS ACCOMPANIED BY:

- ☒ 1 A single copy of a provisional specification of ...8... pages
- ☐ 2 Two copies of a complete specification of pages
- ☒ 3 ...1 ... Sheet of Informal Drawings
- ☐ 4 Sheets of Formal Drawings
- ☐ 5 Publication particulars and abstract (Form P8 in duplicate)
- ☐ 6 A copy of Figure of drawings (if any) for the abstract
- ☐ 7 Assignment of Invention
- ☐ 8 Certified priority document(s) Number(s)
- ☐ 9 Translation of priority document(s)
- ☐ 10 An assignment of priority rights
- ☐ 11 A copy of the Form P2 and the specification of SA Patent Application
- ☐ 12 A declaration and power of attorney on Form P3
- ☐ 13 Request for ante-dating on Form P4
- ☐ 14 Request for classification on Form P9
- ☒ 15 Form P2 in duplicate

21 01

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Dated this 8th day of November 2002

McCALLUM, RADEMEYER & FREIMOND
PATENT AGENTS FOR APPLICANT(S)



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PATENTS ACT, 1978

PROVISIONAL SPECIFICATION

(Section 30(1) – Regulation 27)

OFFICIAL APPLICATION NO

21	01	2002/9083
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LODGING DATE

22	8 November 2002
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FULL NAME(S) OF APPLICANT(S)

71	GRINAKER-LTA LIMITED
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FULL NAME(S) OF INVENTOR(S)

72	ERASMUS, Nico and VISAGIE, Joseph Cornelius
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TITLE OF INVENTION

54	MINE SUPPORT
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BACKGROUND OF THE INVENTION

This invention relates to a mine support suitable for use in an underground excavation to provide support between a footwall and an opposed hanging wall.

5 Large excavations of the types encountered, for example, in coal mines wherein coal seams are removed using mechanised methods such as continuous coal miners, require substantial supports. These supports may for example be constructed by stacking a large quantity of wooden or concrete slabs one over the other to form a pack. Although this approach can work it is
10 tedious and expensive. For example if the excavation height is in excess of, say, 3m a large number of slabs must be stacked on one another to obtain the required height and, moreover, the cross sectional area of the stack must be sufficiently large to ensure that the height to area ratio of the stack is acceptable and stable under the operating conditions.

15 In an alternative approach to the problem it is known to make use of a tubular column which is completely filled with a yieldable material. The column is placed in position, in the excavation, using a suitable machine. This approach substantially reduces the amount of time needed to provide a support. On the other hand the characteristics of the yieldable material are such that, again,
20 the cross sectional area of the support must be significant in order to achieve an acceptable height to cross sectional area ratio for the column. For example with a column height of the order of 3,5m a column diameter of about 900mm

is required. Thus it is necessary to take careful consideration of the size of the column and its cost before making a decision to use a column of this type.

SUMMARY OF INVENTION

5 The invention provides a mine support which includes a deformable tubular sleeve, a first material with a first strength characteristic inside, and filling, a first portion of the sleeve, and a second material with a second strength characteristic which differs from the first strength characteristic inside, and filling, a second portion of the sleeve.

10 The first portion may be adjacent the second portion. The length of the first portion, in an axial direction of the sleeve, may be greater than the length of the second portion in the axial direction of the sleeve.

15 The length of the first portion may vary according to requirement and may be as high as 90% of the axial length of the sleeve. Similarly the length of the second portion may vary according to requirement and may be up to 30% of the axial length of the sleeve and as low as 10%.

The first material may comprise a lightweight cementitious mixture, for example foamed or aerated concrete.

The second material may comprise a lightweight cementitious mixture, for example a foamed or aerated concrete.

The first material may be stronger than the second material ie. it may have a higher hardness. The density of the first material may be in excess of 900kg/m³ and typically lies in the range of from 1000 to 1100kg/m³.

5 The density of the second material may be less than 1000kg/m³ and typically lies in the range of from 800 to 900kg/m³.

It is to be understood that these densities values are given only by way of example and can be varied according to requirement to produce different yield characteristics.

10 The tubular sleeve may comprise any suitable material and preferably is made from a ductile metal.

In a different form of the invention the sleeve is made from a frangible material such as plastic, fibre, reinforced concrete, resin impregnated paper, or the like.

15 The sleeve may have a length of up to 3,6m and the diameter of the sleeve may be of the order of 450mm.

BRIEF DESCRIPTION OF THE DRAWING

The invention is further described by way of example with reference to the accompanying drawing which illustrates from the side and in cross section a mine support according to the invention.

DESCRIPTION OF PREFERRED EMBODIMENT

The accompanying drawing illustrates a mine support 10 positioned in an underground excavation 12, extending between a footwall 14 and an opposed hanging wall 16 of the excavation.

- 5 The height 18 of the excavation may be substantial and normally is of the order of from 3 to 5,5m.

The support 10 includes a tubular sleeve 22 which may be made from ductile metal like mild steel, reinforced concrete, plastic, resin impregnated paper etc. The tubular sleeve is circular and has a diameter 24, which varies according to requirement, but which typically is of the order of 450mm. On surface the sleeve is filled with a first cementitious mixture 28 which extends from one end of the sleeve over a first portion 30 of the length of the sleeve. The mixture 28 is a lightweight cementitious mixture made from aerated concrete and has a density in the range of 1000 to 1100kg/m³.

- 10
- 15 Once the mixture 28 has set the remainder of the sleeve is filled with a second lightweight foamed cementitious mixture 32 which has a density in the range of from 600 to 900kg/m³. The mixture 32 contacts an inner surface 34 of the mixture 28 and, as stated, extends over the remainder of the length of the sleeve, designated 36, to the respective end of the sleeve.

- 20 The support is fabricated on surface under factory conditions and is then transported to an underground location using mechanised means. If the

sleeve is too long for the particular excavation in which it is to be used then it is reduced in size by cutting a section of the sleeve off. This reduces the length of the support.

5 The support is transported to the site of use and then erected in a vertical position using a device such as a modified fork lifter. The accompanying drawing illustrates that an upper end 40 of the support is spaced slightly from an opposed surface of the hanging wall 16. A prestressing bag or device 42 of a kind which is known in the art is then positioned in the gap between the end 40 and the hanging wall 16 and is actuated to place the support under 10 axially directed loading. This aspect is known in the art and therefore is not further described herein.

15 When closure of the hanging wall towards the footwall takes place the material 32, which is not as strong as the material 28, starts yielding. The material 28 does not yield, at least initially. As the material 32 yields the corresponding portion of the sleeve 22 is deformed substantially. When the material 32 has yielded to the maximum extent a substantial increase of the force which is exerted by the closure event must occur before the material 28 will yield.

20 The support of the invention is based on the principle that the material 28, which is stronger than the material 32, extends over a greater portion of the length of the support and consequently imparts significant strength and rigidity to the support. This enables the cross sectional area of the support to be

reduced. On the other hand in order to allow for the support to yield, under load, the material 32 is made weaker than the material 28. The length 36 is significantly less than the length 30 and the provision of the weaker material 32 does not materially effect the stiffness of the support. As the support is not normally required to yield over its full length, for this would mean that the excavation in which it is used has become completely closed, a decision is taken on the degree of yielding which is required and the length 36 of the material 32 is established in accordance with this decision.

It follows that the overall dimensions of the support of the invention can be reduced significantly compared to the case in which a tubular support is formed from a sleeve filled with only one type of material.

It is apparent that it is possible to extend the principles which have been described by including a third material inside the sleeve. It is also possible to position the material 28 between material 32 which is positioned at one end of the sleeve and similar material 32 positioned at an opposing end of the sleeve. In other words each end of the sleeve would therefore yield when subjected to axial loading.

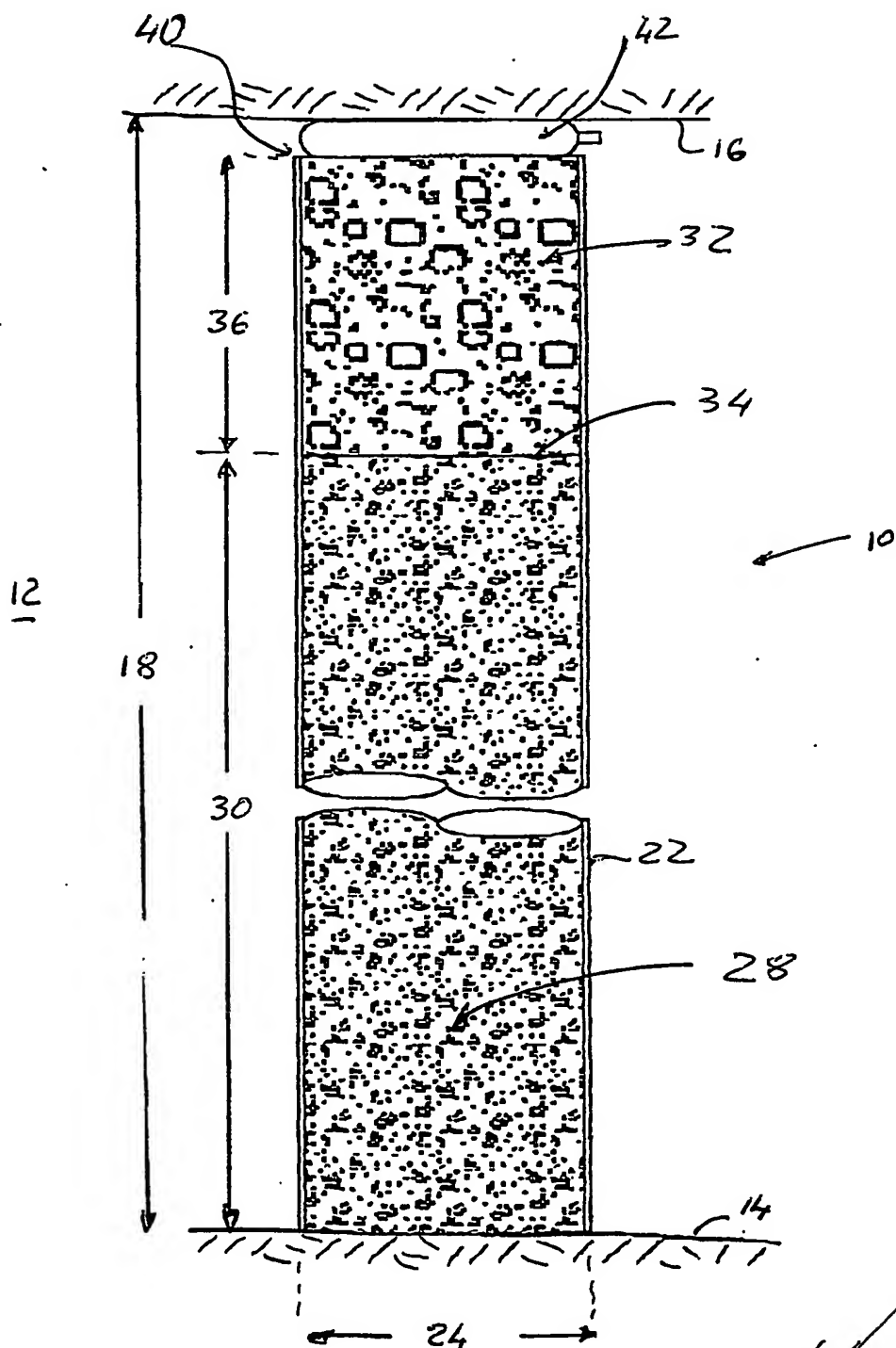
The material 32 is preferably aerated concrete. It is possible though to weaken a suitable concrete mix in other ways for example by forming voids or holes in the concrete which, when axially loaded, promote yielding in a controlled manner.

Dated this 8th day of November 2002.

A handwritten signature in black ink, consisting of a series of loops and a long horizontal stroke extending to the right.

McCALLUM, RADEMEYER & FREIMOND
Patent Agents for the Applicant

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Mr. R